What is claimed is:

1. A method for preparing aluminum nitride comprising:

preparing a reactant-containing body filled with admixtures of aluminum powder, a diluent and nitrogen-containing solid compound, said reactant-containing body having a crucible;

placing said crucible of said reactant-containing body on a base in a reaction chamber;

preheating said reactant-containing body to a predetermined temperature for a predetermined period of time;

vacuuming said reaction chamber;

introducing a re-circulating nitrogen gas through said reactant-containing body in said reaction chamber;

re-circulating a coolant between an inner wall and an outer wall of said reaction chamber; and

igniting a ignition portion to perform a combustion synthesis process, thereby preparing the aluminum nitride.

2. The method for preparing aluminum nitride according to claim 1, wherein said reactant-containing body has:

said ignition portion located at the topmost of said reactant-containing body;

a propagating portion located next to said ignition portion;

a sustaining portion located next to said propagating portion; and

an ending portion located next to said sustaining portion, wherein pure aluminum fine powder is filled in said ignition portion; a higher weight ratio of aluminum powder to

said diluent is filled in said propagating portion; a medium weight ratio of aluminum powder to said diluent is filled in said sustaining portion; and a lower weight ratio of aluminum powder to said diluent is filled in said ending portion.

3. The method for preparing aluminum nitride according to claim 2, wherein said reactant-containing body further comprises a multi-layered structure.

4. The method for preparing aluminum nitride according to claim 3, wherein said multi-layered structure is formed by a plurality of shapes selected from a group consisting of cylinders and polygonal prisms.

5. The method for preparing aluminum nitride according to claim 3, wherein said multi-layered structure is made of an one-piece element rolled in a helical form, and the outer end of said helical form is sealed as a closed end.

6. The method for preparing aluminum nitride according to claim 3, wherein said multi-layered structure is formed by a material selected from a group consisting of aluminum net, aluminum sheet and aluminum foil.

7. The method for preparing aluminum nitride according to claim 3, wherein said multi-layered structure is removed after said admixtures are completely filled in said reactant-containing body.

8. The method for preparing aluminum nitride according to claim 2, wherein said reactant-containing body further comprises a hollow housing fixed on said

crucible, and said multi-layered structure placed in said hollow housing, and said propagating portion, said sustaining portion and said ending portion are distributed diametrically from the center of said reactant-containing body.

9. The method for preparing aluminum nitride according to claim 2, wherein said reactant-containing body further comprises a hollow housing fixed on said crucible, and said propagating portion, said sustaining portion and said ending portion are distributed vertically from the top to the bottom of said hollow housing.

10. The method for preparing aluminum nitride according to claim 2, wherein, the weight ratio of aluminum powder to said diluent filled in said propagating portion is between about 6:1 to about 12:1; the weight ratio of aluminum powder to said diluent filled in said sustaining portion is between about 2:1 to about 6:1; and the weight ratio of aluminum powder to said diluent filled in said ending portion is between about 1:1 to about 4:1.

11. The method for preparing aluminum nitride according to claim 1, wherein said nitrogen-containing solid compound is selected from a group consisting of sodium nitride (NaN_3) powder, potassium nitride (KN_3) and barium nitride ($Ba_3 N_2$).

12. The method for preparing aluminum nitride according to claim 1, wherein said nitrogen-containing solid compound is less than or equal to 10%.

13. The method for preparing aluminum nitride according to claim 1, comprising cooling said re-circulating nitrogen gas during said combustion synthesis process.

14. The method for preparing aluminum nitride according to claim 1, wherein said predetermined temperature is between about 90℃ and about 400℃.

15. The method for preparing aluminum nitride according to claim 1, wherein said predetermined period of time is between about 30 minutes and about 90 minutes.

16. The method for preparing aluminum nitride according to claim 1, wherein said diluent is selected from a group consisting of AlN, Al_2O_3, BN, Si_3N_4, TiN, SiC, ZrO_2, TiO_2 and SiO_2.

17. A method for preparing aluminum nitride comprising:

preparing a reactant-containing body filled with admixtures of aluminum powder, a diluent and nitrogen-containing solid compound, wherein said reactant-containing body has:

an ignition portion located at the topmost of said reactant-containing body;

an upper layer located next to said ignition portion;

an middle layer located next to said upper layer; and

a lower layer located next to said middle layer, each of said upper layer, said middle layer and said lower layer having a propagating portion located in the center, a sustaining portion located next to said propagating portion, and an ending portion located next to said sustaining portion, wherein pure aluminum fine powder is filled in said ignition portion, and the weight ratio of aluminum powder to said diluent filled in said propagating portion of said upper layer is lowered than the weight ratio of aluminum powder to said diluent filled in the

ignition portion; and the weight ratios of aluminum powder to aluminum nitride filled in said propagating portion of said middle layer and said lower layer are decreased sequentially; and for each of said upper layer, said middle layer and said lower layer, the weight ratios of aluminum powder to aluminum nitride filled in said propagating portion, said sustaining portion and said ending portion are decreased sequentially;

placing a crucible of said reactant-containing body on a base in a reaction chamber;

preheating said reactant-containing body to a predetermined temperature for a predetermined period of time;

vacuuming said reaction chamber;

introducing a re-circulating nitrogen gas through said reactant-containing body in said reaction chamber;

re-circulating a coolant between an inner wall and an outer wall of said reaction chamber; and

igniting said ignition portion to perform a combustion synthesis process, thereby preparing the aluminum nitride.

18. The method for preparing aluminum nitride according to claim 17, wherein said nitrogen-containing solid compound is selected from a group consisting of sodium nitride (NaN_3) powder, potassium nitride (KN_3) and barium nitride ($Ba_3 N_2$).

19. The method for preparing aluminum nitride according to claim 17, wherein said nitrogen-containing solid compound is less than or equal to 10%.

20. The method for preparing aluminum nitride according to claim 17, comprising cooling said re-circulating nitrogen gas during said combustion synthesis process.

21. The method for preparing aluminum nitride according to claim 17, wherein said predetermined temperature is between about 90℃ and about 400℃.

22. The method for preparing aluminum nitride according to claim 17, wherein said predetermined period of time is between about 30 minutes and about 90 minutes.

23. The method for preparing aluminum nitride according to claim 17, wherein said diluent is selected from a group consisting of AlN, Al_2O_3, BN, Si_3N_4, TiN, SiC, ZrO_2, TiO_2 and SiO_2.

24. An apparatus for preparing aluminum nitride comprising:

a reaction chamber having an inner wall and an outer wall, wherein a coolant is re-circulated between said inner wall and said outer wall;

a base having a plurality of first through holes, wherein said base is used for supporting a reactant-containing body filled with admixtures composed of aluminum powder, a diluent and a nitrogen-containing solid compound, said reactant-containing body comprising a hollow housing fixed on a crucible having a plurality of second through holes;

a preheating device installed around said reactant-containing body, wherein said reactant-containing body is preheated and maintained at a predetermined temperature

for a predetermined period of time;

a nitrogen re-circulation system used for withdrawing and delivering a nitrogen gas through said plurality of through holes to said reactant-containing body, wherein said nitrogen re-circulating system comprising a cooling unit used for cooling said nitrogen gas before entering said reaction chamber; and

an igniting device used for igniting said admixture at a central area of the top of said reactant-containing body, thereby preparing aluminum nitride.

25. The apparatus for preparing aluminum nitride according to claim 24, wherein said reactant-containing body further comprises a multi-layered structure placed in said hollow housing, and a propagating portion, a sustaining portion and an ending portion are distributed diametrically from the center of said reactant-containing body.

26. The apparatus for preparing aluminum nitride according to claim 25, wherein said multi-layered structure is formed by a plurality of shapes selected from a group consisting of cylinders and polygonal prisms.

27. The apparatus for preparing aluminum nitride according to claim 25, wherein said multi-layered structure is made of an one-piece element rolled in a helical form, and the outer end of said helical form is sealed as a closed end.

28. The apparatus for preparing aluminum nitride according to claim 25, wherein said multi-layered structure is formed by a material selected from a group consisting of aluminum net, aluminum sheet and aluminum foil.

29. The apparatus for preparing aluminum nitride according to claim 25, wherein said multi-layered structure is removed after said admixtures are completely filled in said reactant-containing body.

30. The apparatus for preparing aluminum nitride according to claim 24, wherein said reactant-containing body further comprises a propagating portion, a sustaining portion and an ending portion are distributed vertically from the top to the bottom of said hollow housing.

31. The apparatus for preparing aluminum nitride according to claim 24, wherein said nitrogen-containing solid compound is selected from a group consisting of sodium nitride (NaN_3) powder, potassium nitride (KN_3) and barium nitride ($Ba_3 N_2$).

32. The apparatus for preparing aluminum nitride according to claim 24, wherein said nitrogen-containing solid compound is less than or equal to 10%.

33. The apparatus for preparing aluminum nitride according to claim 24, wherein said predetermined temperature is between about 90℃ and about 400℃.

34. The apparatus for preparing aluminum nitride according to claim 24, wherein said predetermined period of time is between about 30 minutes and about 90 minutes.

35. The apparatus for preparing aluminum nitride according to claim 24, wherein said crucible has a groove for securing said hollow housing.

36. The method for preparing aluminum nitride according to claim 24, wherein said diluent is selected from a group consisting of AlN, Al_2O_3, BN, Si_3N_4, TiN, SiC, ZrO_2, TiO_2 and SiO_2.